WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005DC73B

Title: Air-Deposited Pollutants in the Anacostia River Watershed

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Abstract

In the early 1970s, at the inception of the Clean Air and Water Act the issues of air and water pollution were considered two distinct, separate and unrelated problems. Research in metrology and geophysical fluid mechanisms have revealed over the years that there is a constant exchange of mass, energy, and momentum between air and sea brought about by hurricane activities. Furthermore, more recent research on the health of the major waterways in the area, such as, the Chesapeake Bay have yielded a better understanding of the link between air pollutants and land-based and water-based pollution resulting from atmospheric induced contaminant deposit in the major water ways.

Two major sources of water pollution emanating from atmospheric dynamics are nitrogen and phosphorus. This present investigation aims to focus on the contribution of aviation jets efflux to the adverse environmental poisoning of the Anacostia watershed. The combustion of aviation fuel, especially at take-off and landing, leads to the build-up of nitrogen oxide (NOx) or airborne nitrogen. In addition to the aviation-generated environmental pollution, household equipments, boats, trains and cars are also additional sources of environmental pollution of the major watersheds. This type of air pollution

does not fall directly into the waterways; rather they get washed out of the air as rain, snow or fog ¡V commonly known as wet deposition or as gases and tiny particles (aerosol) ¡V dry deposition. Some of the land precipitation gets transported to rivers by storm water runoff or through groundwater flow.

Since the late 1980s computer models have shown that approximately 25% of nitrogen entering the Bay, for example, results from air pollution. The environmental quality of the Anacostia River continues to be the most urgent long-term water resources problems in the District of Columbia. Whereas dramatic improvement has been noted in the health of the Chesapeake Bay over the past years, studies continue to show stagnation or worsening in the health of the Anacostia River. The health of the Anacostia River has great influence on the overall ecosystem, including the vegetation, marine life, and the quality of life of the communities that depend on the Anacostia River. It is widely accepted that cleanup of the Anacostia River will lead to economic resurgence in the region, restoration of marine life and their habitats, improvement in water quality and clarity, and the overall health of the surrounding population.

At present, assessing the proportion of pollution induced locally by aircraft is a challenging task.

„X Measuring techniques cannot be used to differentiate between pollutants emitted by road traffic and airport activities as a whole, and those discharged by aircraft on the ground [2].
„ X Pollution knows no frontiers. The airport is surrounded by other sources of pollution (roads, other companies, etc.) [2].
„ X Complexity of Domain. Once pollutants are released into the air they may breakdown or combine with other chemicals in the air and be transported short or long distances. Some of the factors that determine how far pollutants can travel through the air include, the makeup of the pollutant, weather conditions (wind, temperature, humidity), type and height of emission source (smokestack, automobile tail pipe), and the presence of other chemicals in the air. If the wind carries the plume of pollution high enough in the air, it may travel for hundreds of miles before being brought to earth. This is known as long-range or long-distance transport. Airborne pollutants fall to the earth's surface by wet deposition, or dry deposition. Airborne pollutants that deposit on the landscape can be transported into streams, rivers, and the Bay by runoff or through groundwater flow [1].
„ X Uncertainty of Data and model [3]. High overall persistence and long-range transport potential have been recognized as hazardous characteristics for chemicals that might be released to the environment and used in various contexts for the assessment of the hazard posed to the environment by chemicals. However, it is difficult to directly measure these two descriptors of chemical fate in the environment. Multimedia models have been found to be appropriate tools for calculating numerical values for these two characteristics. The results of these calculations are subject to two main types of uncertainties. First, they are influenced by parameter uncertainty that is due to uncertainty in the measurement methods for chemical substance properties as well as due to natural variability of the environmental parameters within the large areas represented by the multimedia models.

The second major uncertainty is due to differences between the various multimedia models available for the calculation.